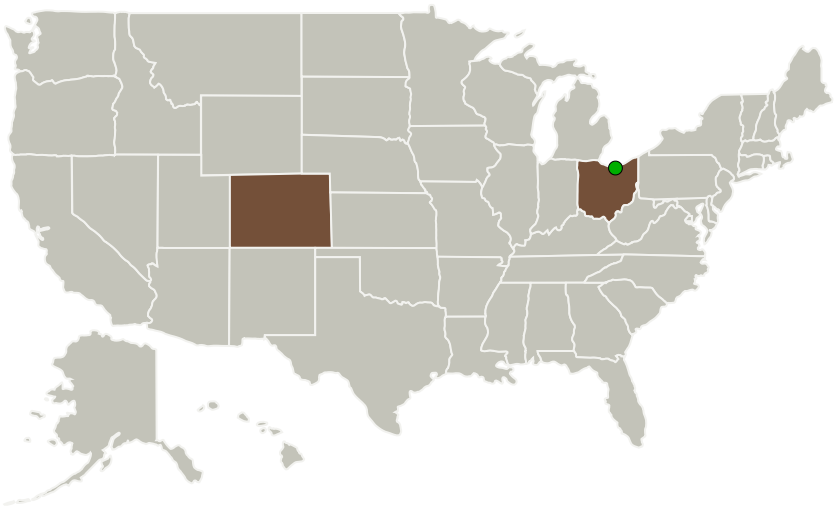
Nitrous Ethane-Ethylene Rocket with Hypergolic Ignition, Phase I

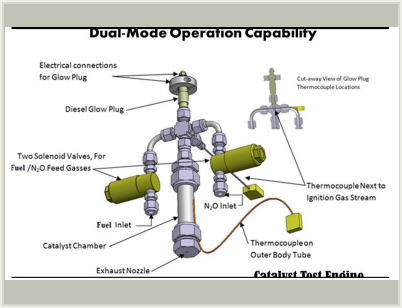
Completed Technology Project (2015 - 2015)

Project Introduction

The Nitrous Ethane-Ethylene Rocket with Hypergolic Ignition (NEERHI) engine is a proposed technology designed to provide small spacecraft with non-toxic, non-cryogenic, high performance, hypergolic propulsion. When passed over a warm ruthenium catalyst bed, gaseous nitrous oxide and an ethylene-ethane gaseous blend combust instantly. A small 1 N thruster can be designed to provide small satellite propulsion systems with a specific impulse of approximately 300 seconds. Both propellants are self-pressurizing, capable of delivering feed line pressures in excess of 800 psi at room temperature, and 400 psi if cooled to 0?C. For longer duration missions, both nitrous oxide and an ethane-ethylene fuel blend do not require thermal heating to maintain a liquid state, and as such, can be stored on Earth or in space for in-definite periods of time with no parasitic power drain required to maintain a liquid propellant. Compared to other available chemical propulsion systems, a NEERHI system offers a cost effective solution as other hypergolic engines use hydrazine and nitrogen tetroxide which are toxic and dangerous to handle, increasing ground costs. As an added capability, the NEERHI engine has the ability to operate as a monopropellant engine if the ruthenium catalyst be is heated with a bipropellant reaction, increasing the lifetime of the catalyst bed and reducing heating loads on the engine.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Pioneer Astronautics	Lead Organization	Industry Historically Underutilized Business Zones (HUBZones)	Lakewood, Colorado
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Colorado	Ohio

Project Transitions

June 2015: Project Start

December 2015: Closed out

Closeout Summary: Nitrous Ethane-Ethylene Rocket with Hypergolic Ignition, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/139167)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Pioneer Astronautics

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Robert M Zubrin

Co-Investigator:

Robert Zubrin

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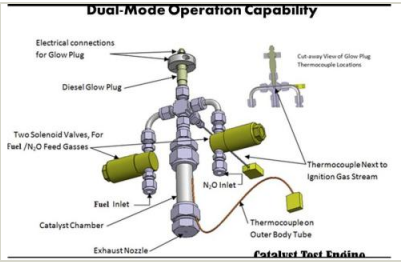
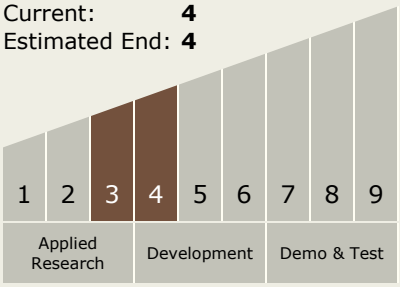
Images



Briefing Chart Image
Nitrous Ethane-Ethylene Rocket with Hypergolic Ignition, Phase I *(https://techport.nasa.gov/image/136835)*

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.1 Chemical Space Propulsion
    - TX01.1.2 Earth Storable

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System